EFFECTS OF INTENSITY AND FREQUENCY OF DEFOLIATION ON A MIXTURE OF GUINEA GRASS (*PANICUM MAXIMUM* CV. COLONIAO) AND VERANO STYLO (*STYLOSANTHES HAMATA* CV. VERANO)

A thesis presented in partial fulfilment

of the requirements for the degree

of Master of Agricultural Science in Plant Science

at Massey University, Palmerston North,

New Zealand

PICHET SUKPITUKSAKUL

1985

Abstract

A study was conducted in a glasshouse to determine the effect of defoliation treatments comprising combinations of two intensities (7.5 cm and 15.0 cm cutting height) and three frequencies (2, 3 and 6 weeks) on production, botanical composition and crude protein of a Guinea grass (Panicum maximum cv. Coloniao) / Verano stylo (Stylosanthes hamata cv. Verano) sward.

Total cumulative yield was reduced with more intense defoliation and decreased as the sward was defoliated more frequently. A similar response was observed for cumulative grass yield. In legume, cumulative yield was reduced at hard intensity but was not influenced by defoliation frequency.

The proportion of the legume component in the sward was not influenced by defoliation intensity but increased with increasing defoliation frequency due more to depressed grass growth rather than a promotion in legume growth.

Defoliation intensity and defoliation frequency had no effect on legume branch number. Similarly, branch size was not influenced by defoliation frequency but increased with less intense defoliation.

Both defoliation intensity and defoliation frequency influenced grass tiller number. It was increased with more intense defoliation. The sward defoliated at moderate frequency resulted in the highest tiller number. Tiller number was not different between very frequent and infrequent defoliation. Intensity and frequency of defoliation also influenced average tiller size. It was reduced with more intense defoliation and decreased with increasing defoliation frequency.

Percent crude protein content of both grass and legume was not influenced by defoliation intensity but was reduced with less frequent defoliation. The percent crude protein content in the legume which was more than double that in the grass indicates that Verano stylo has important contributions in the development and management of a legume-based tropical pasture.

Acknowledgements

I am indebted to my supervisor, Dr. Alex Chu, for guidance, encouragement, assistance and patience throughout the masterate studies. My co-supervisors, Dr. Christ Korte and Mr. P.N.P. Matthews, gave valuable advice on several aspects of the study and assisted with manuscript preparation.

I also owe a great debt to Prof. B.R. Watkin for enabling me to study in New Zealand and for the very helpful advice, encouragement and support.

I would like to acknowledge the assistance given to me by the following:

Dr. Murray Hill and staff for using facilities at the Seed Technology Centre.

Mr. Angus Robertson for the preparation of Rhizobium liquid culture.

Dr. R.J. Clements, CSIRO, for providing grass and legume seeds.

Mr. Terry Lynch and his staff and Mr. Dave Sollitt for technical assistance.

Mr. L.G. Cranfield and other members of the Plant Growth Unit for their technical advice.

Mr. Suwit Laohasiriwong for his advice on computing and nitrogen analysis.

Mr. George Halligan for drawing the figures.

Mrs. Griselda Blazey for carefully typing the manuscript.

The members of the Agronomy Department for their helpful discussion.

The Dairy Farming Promotion Organisation of Thailand (DPO) for allowing me to study in New Zealand and to the New Zealand government for BAP scholarship.

Finally, a big thank to my wife, Chitvipa, for her patience and support.

Contents

Appendices

Figures

Plates

Tables

Chapter 1

Introduction

Pastures in the tropics commonly consist of grasses such as Guinea grass (*Panicum maximum*), Paragrass (*Brachiaria mutica*), and Napier grass (*Pennisetum purpureum*) which mature very quickly with a corresponding decline in digestibility (Milford and Minson, 1966), voluntary intake (Milford and Minson, 1968; Minson and Milford, 1968) and especially that of protein content (Vicente-Chandler *et al*, 1974). The higher intake of digestible energy and protein of tropical legumes at all but the early growth stages will increase the quality of the mixed sward when they are incorporated into pastures (Whiteman, 1980).

Since yield of dry mater, crude protein (Horrel, 1964, Vicente-Chandler *et al*, 1953), digestible dry matter intake (Minson and Milford, 1967) and animal live weight gain (Evans, 1970; Norman, 1970) are linearly related to legume content in the mixture, the legume/grass mixed pasture should be managed such that a high and stable proportion of legume is maintained. Legumes will be reduced in the sward when competition from the grass component is strong. Therefore frequent and intense removal of the grass component by defoliation should be favourable to the legume component in a mixed sward.

However, little information is available on the effects of different defoliation intensities and frequencies on tropical grass/legume mixtures. Such studies are urgently needed in assisting grazing management decisions of tropical pastures.

This experiment was designed to study the effects of different intensities and frequencies of defoliation on the production, composition and protein content of a Guinea grass (*Panicum maximum* cv. Coloniao)/Verano stylo (*Stylosanthes hamata* cv. Verano) sward.